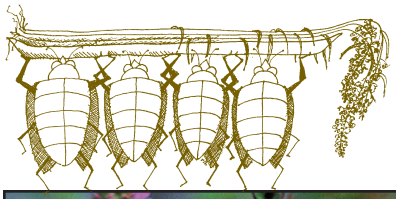


# ACTIVITY 6 GRADES 6-12

## CHOOSING BIOLOGICAL CONTROL AGENTS*

### Objectives

Students will develop criteria to use when choosing biological control agents.

Students will evaluate potential agents for use as biological control against purple loosestrife.

### Time Suggestion

45 minutes.

### Wisconsin Model Environmental Education and Science Standards

**Environmental Education:** A.8.1, A.8.4, A.8.5, A.8.6, B.8.8, B.8.14, D.8.1, D.8.6, A.12.3, A.12.4, A.12.1, C.12.3, C.12.4, D.12.1.

**Science:** C.8.2, C.8.6, C.8.7, C.8.9, C.8.11, F.8.7, G.8.5, H.8.2, B.12.4, C.12.6, F.12.7, F.12.8, G.12.5, H.12.4, H.12.6.

### DESCRIPTION

Scientists who conduct biological control programs for a pest must first choose appropriate control agents, typically the pest's natural enemies. Biologists must then decide whether or not these agents are safe for importation and likely to be effective. This activity simulates this process with actual examples from the purple loosestrife biological control program.

### PROBLEM

How do scientists develop and apply the criteria with which to choose natural enemies for use in biological control programs?

### MATERIALS

- ☐ Copies of student handout "Rules for Selecting and Releasing Biological Control Organisms" (page 20).
- ☐ Copies of student table "Candidates for Biological Control and their Characteristics" (pages 18-19).

### PROCEDURES

1. Divide the class into teams of three. Each team should brainstorm a list of rules to be used when choosing biological controls.
2. Distribute copies of the student handout, "Rules for Selecting and Releasing Biological Control Organisms."
3. Using the background information, edit to improve the lists of rules for picking a biological control.
4. Use the table "Candidates for Biological Control and Their Characteristics" to categorize each insect as acceptable or unacceptable biological controls for purple loosestrife. Have students rank the top five control agents and justify their choices.

Collect class data and come to a consensus on rules and the top five biological control choices for purple loosestrife.

### BACKGROUND INFORMATION

Biological control is the process of using one organism to control another that has become a pest. A pest is often an organism from another region that has become a problem because it was imported (often accidentally) without its natural enemies. Classic biocontrol introduces a pest's natural enemies from their native region to help establish a balance between

the pest and its enemies in the newly occupied territory. This must be done with care, however, and requires much research and analysis to be sure the imported enemies will not themselves become pests in the new region, perhaps even worse than the pest they are introduced to control.

Natural enemies, such as predators, parasites, and diseases, can all be used to help control pest plants. A pest's natural enemies will be found in its native home. If the pest is an exotic, that is, has been introduced from another remote region, its natural enemies must be found there. Such enemies are usually the best for biological control because they are already well adapted for feeding on the pest and, if carefully chosen, are unlikely to feed on other species in the new region. If such a control species can be found, large numbers of these enemies should be released. Doing this could both be environmentally safe to use and make the pest less competitive in its new habitat.

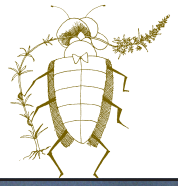
In natural biological communities, such as wetlands, well-chosen natural enemies should help native plants compete more effectively with exotic pests, such as purple loosestrife, and even begin to replace them. This should help preserve the diversity and quality of such areas. (Biological control can also be used in agricultural settings.)

Few organisms native to the new country are selected as biological control agents for an exotic pest because they are not usually well adapted to feeding on the pest species and are, of course, capable of feeding on other, native organisms. Native control organisms would probably have to be produced in larger numbers than the pest's natural enemies to achieve the same level of control. Native control organisms are also more likely to become pests themselves since they can shift from the exotic host to native hosts that may not be prepared for the native organism's unusually large numbers.

There are general rules that scientists follow in trying to find good potential biological control organisms. Any chosen control species' actual value in controlling a pest will not be known until it is released on or near the pest. The rules, however, can make it possible to both avoid control species that will be unsafe to use, and easier to find control species that will be effective and less expensive. One such list of rules is provided on the accompanying student handout. Note that the first and most important rules are ones that deal with safety. Other considerations come later. These rules must be applied with care and intelligence, erring on the side of safety.


Some predators from a pest species' native region can be used as effective biological controls in the pest's new environment.

Purple loosestrife is native to Europe and Asia. Therefore, its control organisms are most likely to come from there. In the 1980s, the search for





potential control organisms was begun throughout Europe and over 100 different species of insects were found that feed on purple loosestrife. This number was initially reduced to six, then to five, by applying the rules discussed above. Finally, only four of these have since been introduced to North America, starting in 1992, because an additional problem was detected in one species while in pre-release quarantine here. Care must constantly be exercised, and additional monitoring of all the released species continued, to insure they are safe for use.

We have assembled a short list of some of the insects initially studied for purple loosestrife control work, along with their characteristics that may be important in choosing safe and effective control organisms. This list is provided in the student table.

Since there are many generalist plant predators here in North America, some or even many will likely feed on purple loosestrife in different places and times. Some of these may even become locally abundant on the plant as they exploit an acceptable, newly found food source. This additional help in controlling loosestrife is expected. It is unlikely, however, that any native predators will be actively reared for release because it is doubtful that they can sufficiently slow the increase of purple loosestrife in our wetlands. It's also difficult to predict what problems they may cause by shifting to native hosts. Biologists, however, are always searching for new, safe, effective and inexpensive control methods. If you ever think you have found an organism that might be worthy of further study, please do not hesitate to inform us of your discovery by e-mailing **brock.woods@wisconsin.gov** or calling (608) 266-2554.

## STUDENT ASSESSMENT

Use the following factors when assessing student performance:

- Contribution to class discussion and justification of choices.
- Ability to work with peers.
- Explanation of the importance of biological control.
- Any assigned research on past successes and failures in biological control.

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Currently, released insects include both *Galerucella* beetles, *Hylobius*, and *Nanophyes marmoratus*. (Note: Hide names until end of activity!)

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* Revised with permission from "Choose Your Enemies Carefully!" in *Biodiversity, Wetlands, and Biological Control.*